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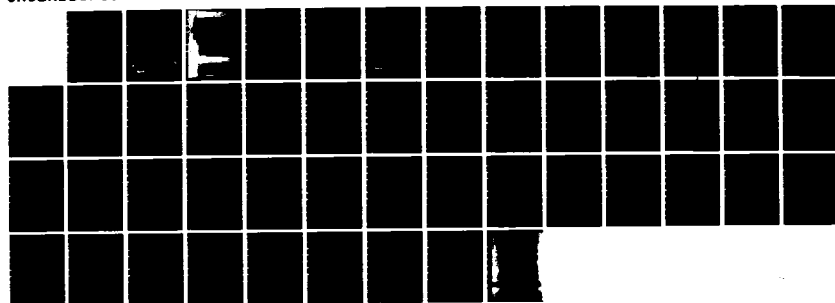
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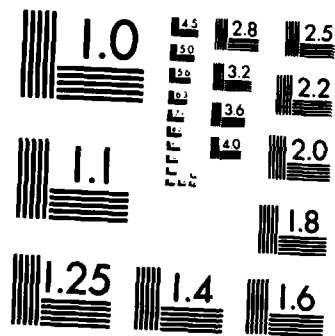
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**A RAND NOTE**

**A FRAMEWORK FOR PLANNING THE EMPLOYMENT  
OF AIR POWER IN THEATER WAR**

Edward L. Warner III, Glenn A. Kent

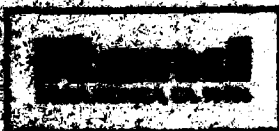
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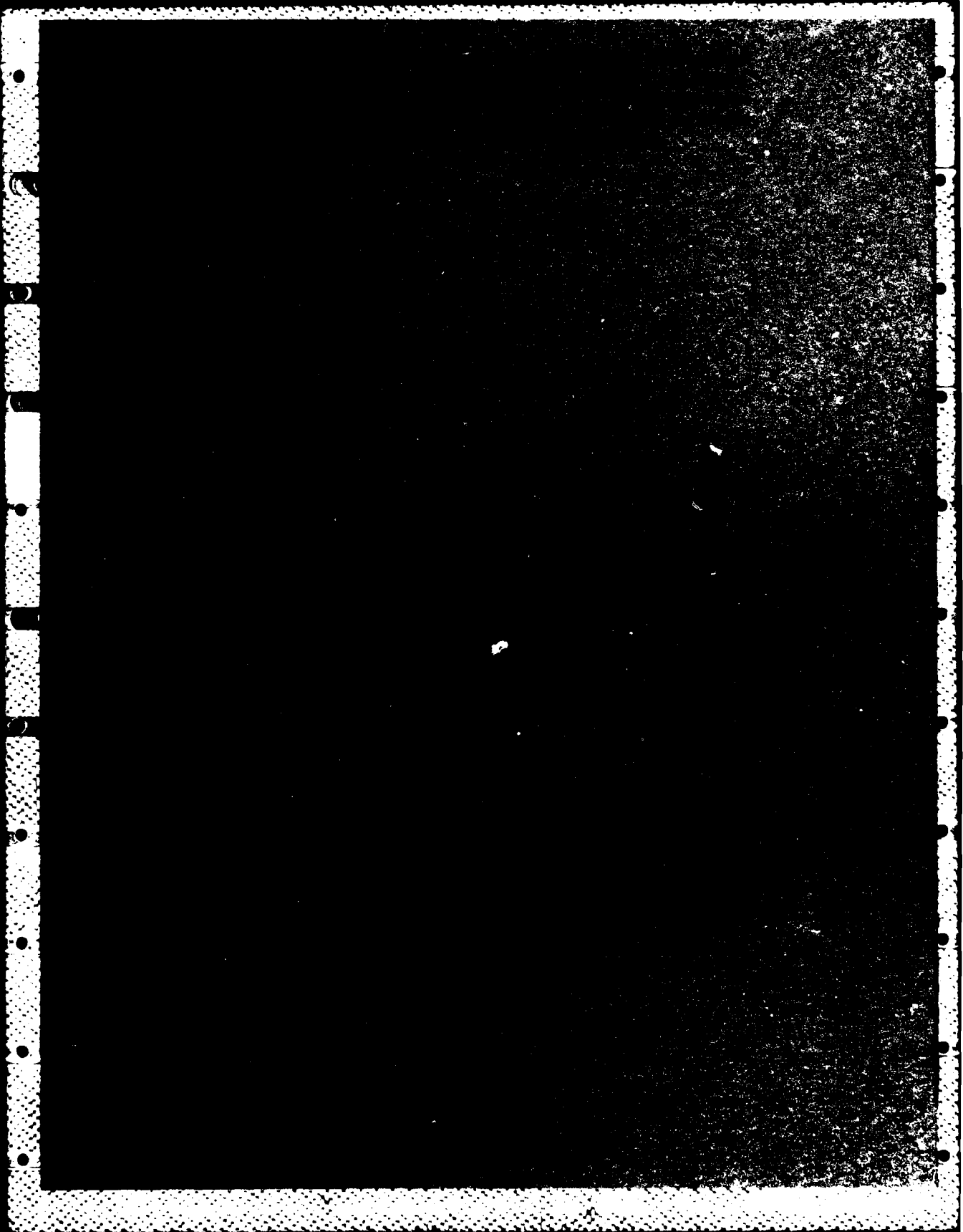
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## A RAND NOTE

### A FRAMEWORK FOR PLANNING THE EMPLOYMENT OF AIR POWER IN THEATER WAR

Edward L. Warner III, Glenn A. Kent

January 1984

N-2038-AF

Prepared for

The United States Air Force

**Rand**  
SANTA MONICA, CA. 90406

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PREFACE

Under the rubric of Project AIR FORCE, "Strategic Policy for the Long-Term Competition," Rand is examining alternative future U.S. national security strategies and their implications for the United States Air Force. As part of this effort, an earlier Rand Note proposed that overall architectural frameworks and concepts of operations be developed and adhered to as a more coherent approach to defense planning.\*

The present Note offers an overall framework for the tactical employment of air power. This framework is more explicit and disciplined than any that has been used heretofore. It sets forth the series of critical functions that must be performed to execute the standard tactical air missions in theater war. The interdiction mission is developed in detail to illustrate the use of the framework.

It is hoped that this Note will stimulate a greater awareness of the utility of a more perceptive and disciplined framework to guide Air Force planning with respect to (1) the development of concepts of operations to accomplish specific tasks, (2) the acquisition of equipment and the formation of organizational units and (3) the use of air power in general.

\*See Glenn A. Kent, *Concepts of Operations: A More Coherent Framework for Defense Planning*, N-2026-AF, August 1983.



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SUMMARY

This Note argues for the utility of developing and adhering to an explicit overall framework to guide the use of air power in support of U.S. military strategies. It offers a conceptual framework to inform Air Force planning for the development of concepts of operations that can assist in acquisition of equipment and the formation of organizational elements. The main feature of the framework is its identification of the range of functions--surveillance, assessment, command, control, asset generation, and engagement/attack--that must be executed to perform effectively each mission in a major theater conflict fought with conventional weapons.

There is nothing novel in the identification of these functions. They reflect well-established Air Force practices and doctrine. The value of this framework lies in the fact that it focuses attention on the process as a whole, highlighting interrelationships among the key functions and the organizations that perform them in the stream of activities that must be integrated to accomplish specific air power missions effectively.

The framework can be used to develop concepts of operations for the application of air power across the full range of strategic and tactical missions. In this Note, however, we confine ourselves to the discussion of its applicability in the context of a major theater conflict.

The preliminary steps in formulating both the overall framework and concepts of operations for each mission include analyzing the enemy military challenge, defining U.S. defense objectives, and identifying the air power missions and tasks in theater war to achieve these objectives. For purposes of this discussion, we assume the enemy to be the USSR.

In a major theater conflict, the USSR would likely conduct a large-scale, combined arms campaign designed to seize the initiative and rapidly defeat the enemy with blitzkrieg air-land assaults. In

recent years, the USSR has increasingly prepared to use conventional firepower in theater conflict, while remaining ready to escalate to nuclear weapons at the first sign that the enemy is preparing to use such weapons decisively.

To defeat such a theater offensive, U.S. (and allied) air and ground forces would have to break up the enemy air offensive; sustain offensive counterair operations to gain air superiority; prevent enemy breakthroughs; disrupt, delay, and destroy enemy follow-on forces; counterattack on the ground; and resupply and reinforce the theater.

Based on these objectives, the first major objective of U.S. and allied tactical air operations would be to gain and retain air superiority in the theater. Another major objective would include delaying, disrupting, and destroying enemy follow-on forces before they entered the battle, impeding resupply efforts, and disrupting the enemy's land campaign. The third major air objective would be to provide close air support to Army units directly engaged with enemy ground forces.

We develop an explicit overall framework that accounts for these objectives; it is shown in matrix form in the figure below. The framework announces the major objectives, missions, and tasks for theater air. It also sets forth the major organizational elements and the functions that they perform in the conduct of tactical air operations.

The critical functions to be performed sequentially and repetitively to carry out the various tactical air missions are described as follows. Surveillance is conducted throughout the theater to obtain information on enemy operations and on the success of friendly forces responding to them. The information from a wide array of surveillance sensors is displayed at assessment centers. These centers assess what is taking place in the air, on the battlefield, and in the rear in order to locate and predict major enemy air activity, critical breakthrough assaults, and the main avenues of enemy advance and to identify specific targets and target areas for possible attack.

The theater commander uses the assessments of the unfolding air-land battle, together with other information, to select an overall

Functions and Organizational Elements Objectives, Missions, Tasks	Surveillance by Sensors	Assessment by Assessment Centers	Command at Various Levels	Control by Control Centers	Sortie Generation by Wings	Engagement/ Attack by Attack Assets
Gain air superiority Defensive counterair Intercept attackers & escorts Cover own attackers Offensive counterair Suppress enemy sortie generation Disrupt air battle management Disrupt air logistic support Air defense suppression Suppress mobile & fixed SAMs & AAA Disrupt air defense radars & communications						
Delay, disrupt, & destroy follow-on ground forces & logistic support Interdiction Slow/ halt movement along key LOCs Delay, disable, & destroy forces in rear Disrupt battle management Disrupt destroy logistic support Support friendly counterthrusts						
Support engaged ground forces Close air support Destroy, disable, & disrupt enemy maneuver units & fire support near friendly forces						
Monitor activity in enemy territory Tactical air reconnaissance Monitor enemy ground & air force movements & activities Acquire information on results of friendly operations						

Fig. — Matrix for developing concepts of theater air operations

operational strategy for the employment of available ground, air, and naval forces and to apportion forces to the various missions. Subordinate command centers in the tactical air control network translate this broad guidance into plans to attack specific targets and the taskings to carry out these attacks.

Wings and fire support elements from U.S. and allied air and ground forces generate fueled and loaded aircraft, missiles, or other attack systems according to a prescribed schedule to conduct attacks. These activities are performed repeatedly as commanders adjust their strategies and allocations of available forces in response to the threats and opportunities that arise in the course of the conflict.

Control centers assist in the timely execution of some of these attacks by assigning targets to specific attack assets on the basis of the latest intelligence and by helping them locate and engage these targets. The latter task is often accomplished with the help of external engagement assistance provided by surveillance and control systems, such as radars and other specialized long-range target acquisition and tracking sensors. Those currently under development include the joint surveillance and targeting attack radar systems (JSTARS) and precision location strike system (PLSS). Finally, the missile and airborne attack platforms engage and attack the various targets, including enemy air bases, lines of communication, battle management and capabilities, and operational units.

The framework describes the function to be performed by each organization element and the inputs and outputs for each. We briefly describe what each element must do to change the inputs to outputs. The framework can be used to: (1) guide the formation of organizational elements; (2) shape the development and acquisition of equipment; and (3) assist in the development of operational concepts.

Different analysts use different frameworks and different terms to describe the use of air power in theater war. This lack of consistency and rigor has been an obstacle to effective planning and successful advocacy of Air Force programs. The framework and vernacular presented in this Note have been developed on the basis of interviews and interactions with many Air Force personnel. The advantages of

establishing an overall conceptual framework and a common vernacular which all will use and in which all the elements readily fit is obvious. An agreement on the overall framework would serve as a starting point for the development of the individual concepts of operations that should be formulated for each of the air power missions and tasks.

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ACRONYMS

AAA	antiaircraft artillery
AFCENT	Allied Forces Central Region (NATO)
ATAF	allied tactical air force
ATOC	allied tactical operations center
AWACS	airborne warning and control system
BCE	battlefield coordination element
CAS	close air support
COIC	combat operations intelligence center
FLOT	forward line of troops
FLIR	forward-looking infrared
frag	fragmentary order (daily air tasking order)
GACC	ground attack control center
JSTARS	joint surveillance and targeting attack radar systems
JTACM	joint tactical missile
LANTIRN	low altitude navigation and targeting infrared for night
LOCs	lines of communication
NATO	North Atlantic Treaty Organization
PLSS	precision location strike system
SAM	surface-to-air missile
TACC	tactical air control center
TFC	tactical fusion center
TMD	tactical munitions dispenser



## I. INTRODUCTION

The Air Force lacks an agreed, coherent framework to assist in formulating explicit, well-articulated concepts for the employment of air power. The absence of such a framework represents an obstacle to sound Air Force planning and decisionmaking, to making a persuasive case for air power to the Department of Defense and Congress, and to coordinating operations with the Army and allied air forces.

To remedy this shortcoming, the Air Force should develop such a framework and use it to set forth specific concepts of operations for carrying out individual Air Force missions, each concept describing the full range of activities to be undertaken sequentially and repetitively to carry out each operation. This Note discusses the importance of developing such concepts of operations for the various tactical air missions and presents a conceptual framework to be used for this process.

Formidable challenges currently facing the Air Force argue for the development of concepts of operations to serve as the foundation for Air Force planning and decisionmaking. In the world arena, the Air Force must contribute to meeting the long-standing Soviet challenge. The Soviet Union has steadily increased its capabilities for waging both conventional and nuclear war in Central Europe and other important theaters and has developed new approaches to the conduct of such warfare. The Air Force must also meet the challenge posed by the recent requirement to prepare to fight effectively in the vital but extremely demanding Southwest Asian theater.

The Air Force faces the further challenge of exploiting new technology. Technological advances embodied in new and developmental equipment are transforming the nature of air operations. New technologies for theater surveillance, information correlation and display, data transmission, target engagement, and precision guidance of munitions, to name but a few, must be integrated successfully if the United States and its NATO allies are to exploit fully the possibilities for prompt, effective attack that they offer.

In addition to these challenges, the Air Force is responding to the Army's recently developed *AirLand Battle* doctrine. This doctrine raises fundamental questions about current arrangements for conducting air interdiction operations against enemy follow-on forces not yet engaged on the battlefield. Consequently, the Army and Air Force are together seeking ways to resolve crucial issues of mutual support and coordination. Measures to improve Air Force cooperation with the Navy are also being refined.

Moreover, air operations in defense of Europe and East Asia would have to be undertaken in close coordination with the combined arms efforts of our allies. In many cases, allied air and ground forces operate in accordance with their own distinctive doctrines. The necessity for close cooperation in fighting a coalition war provides added impetus to the development of an explicit conceptual framework that can be used to analyze, understand, and explain the dynamic process of employing air power in theater conflict.

In the past, the Air Force has tended to address the various dimensions of theater air power employment in isolation. Specific aspects--the collection of intelligence, the utility of a particular weapon delivery platform, or the effectiveness of a certain munition--have usually been examined separately and without sufficient reference to the full range of activities involved in successfully accomplishing a given mission.

Yet in modern warfare, successful military operations will require the coordinated and rapid orchestration of air and ground forces over considerable distances. A major conflict in the NATO theater, for example, would demand tremendous coordination and flexibility and extraordinary integration in responses and initiatives. Orchestrated war-fighting demands broad operational concepts that (1) comprehend the interrelationships among the many activities involved in the effective application of air power and (2) are designed to facilitate joint and combined military operations.

The inherent value of air power--its speed, range, flexibility among various missions, and destructive potential--has been greatly

enhanced by technological developments. But in the absence of an overall conceptual approach, the Air Force is unlikely to develop the arrangements needed to fully exploit emerging technologies.

The broad conceptual framework presented in this Note examines tactical air power employment in several mission areas in terms of the critical functions that must be performed sequentially to carry out the missions. These functions are surveillance, assessment, command, control, asset generation, and engagement and attack. The framework is designed to illustrate the sequential and repetitive nature of these functions and to call attention to the simultaneity and interaction among the specific activities comprising them.

The framework derives from a larger defense planning structure that is being developed by Project AIR FORCE. This approach establishes six logical steps, or levels, of defense planning:

- Level I: Define national goals, objectives, and overall strategies
- Level II: Frame military strategies, identify required military capabilities, and allocate defense resources
- Level III: Formulate concepts of operations to attain specific operational capabilities
- Level IV: Develop and acquire systems
- Level V: Organize, recruit, train, and support military forces
- Level VI: Organize operational commands, develop operational plans, deploy and exercise forces, and fight, if required.\*

Level I, the highest, defines the national goals, objectives, and overall foreign policy strategies of the United States. The U.S. foreign policy strategies include commitments to maintain (1) U.S.-Soviet

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\*These six levels of defense planning are set forth in greater detail in Glenn A. Kent, *Concepts of Operations: A Framework for Defense Planning*, N-2026-AF, August 1983.

parity in the central strategic balance, (2) a credible nuclear deterrent to protect the United States, and most relevant to this discussion, (3) in concert with allies, a credible military deterrent against possible Soviet aggression in key theaters along the periphery of the USSR.

Level II of the defense planning framework involves defining U.S. and allied military strategies to meet these objectives in specific theaters, such as Europe and Korea. In both of these key areas, the United States and its allies seek to deter aggression through a combination of forward defense and flexible response. That is, U.S. and allied forces are prepared to defend well forward, employing conventional weapons to meet and defeat a conventional enemy attack.

At the same time, the United States retains the capability to resort to the flexible and controlled use of nuclear weapons, based either in the theater or in the United States, should the termination of the conflict on favorable terms require such a response. To help underwrite this strategy, the United States maintains combat-ready troops in Western Europe and Korea in peacetime, a capability to rapidly reinforce and resupply these forward deployed forces from the United States, and a readiness to employ theater or central strategic nuclear forces in defense of these theaters.

The remainder of this Note is concerned with Level III of the defense planning framework--the formulation of concepts of operations to guide the employment of air power in support of U.S. military strategies. It concentrates specifically on concepts of operations for the application of air power in a major theater conflict fought with conventional weapons.

Section II of the Note discusses the Soviet and Soviet-style military challenges to the United States and describes the steps that the United States and its allies must be prepared to take to defeat such an enemy attack. It then identifies the specific air operations for which the United States and its allies must ready themselves, describing these operations in terms of specific mission objectives and the functions or tasks that must be undertaken to accomplish them.

Section III presents a conceptual framework for demonstrating the interrelationships among the missions and the functions that must be undertaken to accomplish the missions. It is intended to suggest an integrated way of thinking about the overall process of employing tactical air power. This section devotes special attention to how certain technological advances may be incorporated and, particularly, to how these changes may affect the timely orchestration of air power in a war.

Section IV provides an example of how this framework, expressed in matrix form, can be used to develop concepts of operations for individual missions or tasks and thus to provide the building blocks for a comprehensive operational strategy. The concluding section outlines the advantage to be gained from applying this conceptual framework to both current and long-term planning.

## II. OBJECTIVES, MISSIONS, AND TASKS FOR THE USE OF AIR POWER IN THEATER WAR

### THE SOVIET MILITARY CHALLENGE

Defense analyses over the past decade indicate that in a major conflict, be it in Europe, the Far East, or Southwest Asia, the Soviet Union intends to conduct a large-scale, combined arms campaign designed to seize the initiative and rapidly defeat the enemy through a series of blitzkrieg air-land assaults. The Soviets are prepared to conduct this campaign with conventional, chemical, or nuclear weapons. In recent years, the USSR has increasingly prepared to employ conventional firepower to open such a theater conflict, while remaining poised to introduce nuclear weapons on a massive scale at the first sign that the enemy is preparing to use such weapons decisively. A North Korean attack on the Korean peninsula would likely resemble the Soviet combined arms scenario for a major theater offensive fought with conventional weapons.

On the ground, the Soviets would launch a series of breakthrough assaults with massive artillery and aviation fire support. Where they succeeded, they would insert mobile follow-on forces, including specially configured *mobile groups* or *operational maneuver groups*, to assist in completing the breakthrough, to sustain the momentum of the attack, and to drive deep into U.S. and allied rear areas.

From the outset, a vigorous air campaign would support the ground blitzkrieg. The largest and most critical component of this air offensive in a conflict fought with conventional weapons today would be the so-called air operation--a large-scale, combined bomber, fighter bomber, and tactical fighter assault to be carried out in conjunction with airborne landings and missile-artillery support against selected targets throughout the enemy rear. In Europe, for example, Soviet air forces would repeatedly launch such massed raids over the first several days in an effort to suppress NATO air defenses and to strike key targets in the NATO rear area, giving highest priority to NATO

nuclear capabilities--weapon storage sites, aircraft and missile delivery systems, and associated command and control capabilities.

The Soviets probably also plan to employ conventionally armed operational-tactical ballistic missiles for these missions once they have developed and deployed conventional munitions tailored to the particular task. These missions could also be carried out by medium and intermediate range strategic missiles armed with nuclear warheads based in the western USSR and by similarly armed operational-tactical ballistic missiles deployed in Eastern Europe.

In a conventional or nuclear campaign, the Soviets would also repeatedly attack airfields to achieve air superiority, attempt to disrupt command and control throughout the theater, and strike major enemy fire support means and troop concentrations in the rear and at the front. As a part of this basic campaign, Pact air and ground forces would also employ electronic warfare to further disrupt command and control communications, as well as radars and other electronic systems vital to the functioning of NATO forces. The offensive air operations would be accompanied by persistent efforts to defend their own forces at the front and in the rear against enemy air attacks.

Analysis of Soviet military doctrine indicates that the USSR would probably conduct airborne and air assault operations, often employing special operations forces, against important command centers, nuclear resources, and choke points. The Soviets may also be expected to undertake amphibious operations to support major thrusts along seaward flanks. They would also mount a vigorous campaign against U.S. and allied naval forces, with particular emphasis on attacking carrier battle groups and nuclear armed submarines, to reduce their contribution to the land conflict and their threat to the Soviet homeland.

#### ALLIED DEFENSE OBJECTIVES

To defeat such an enemy theater offensive, U.S. and allied air and ground forces would have to accomplish the following:

- o Break up the enemy air offensive
- o Launch offensive counterair operations to gain air superiority

- o Sustain air operations in the face of continuous waves of enemy attacks
- o Prevent enemy breakthroughs
- o Disrupt, delay, and destroy enemy follow-on forces
- o Carry out counterthrusts on the ground
- o Repel airborne and amphibious assaults
- o Provide a steady flow of resupply and reinforcement into the theater
- o Maintain strategic nuclear and, to the extent possible, theater nuclear and chemical deterrence.

#### AIR POWER OBJECTIVES, MISSIONS, AND TASKS IN THEATER WAR

The first major objective of U.S. and allied tactical air operations in the event of war would be to gain and retain air superiority in the theater. The tasks to be undertaken to achieve air superiority, generally grouped within the offensive counterair, defensive counterair, and defense suppression missions, are described below.

One critical task in the accomplishment of this objective would be to defeat enemy aircraft in the air, that is, to shoot down enemy attackers--bombers, aircraft, fighter-bombers, ground attack aircraft, helicopters, fighter escorts, and defenders. When this task is undertaken in response to enemy attack, it is called *defensive counterair*. When aggressive fighter sweeps are undertaken on one's own initiative over enemy territory, the task is called *offensive counterair*.

Another task critical to gaining and retaining air superiority would be to conduct offensive counterair operations to reduce enemy sortie generation and to degrade the effectiveness of enemy air operations. This could be done by attacking enemy airfields to halt movement on runways and taxiways (thus impeding takeoff and recovery), to destroy enemy aircraft on the ground, or to disrupt his base level command and control and key logistic support activities, such as damage repair, maintenance, ordnance loading, and refueling. The effectiveness of enemy air operations could also be degraded by disrupting air command and control networks and logistic support activities at locations outside major air bases.



A third mission, *air defense suppression*, would be carried out to assist in gaining air superiority. This would involve the use of lethal attacks and electronic jamming to disrupt and destroy enemy fixed and mobile ground-based radars, surface-to-air missiles (SAMs), and antiaircraft artillery (AAA).

A currently emerging offensive counterair task that will become increasingly important over the next decade is the destruction of enemy operational and tactical ballistic missiles. These missiles have long been a critical element of Soviet theater nuclear capabilities, and for this reason alone their destruction with conventional weapons would be highly desirable.

Moreover, the Soviets are apparently developing improved conventional munitions for their latest generation of operational and tactical ballistic missiles--the SS-21, SS-22, and SS-23. These missiles with their new munitions will significantly threaten U.S. and allied air bases. Given the difficulty of defending against ballistic missiles and the current treaty prohibition against preparing to do so, developing the capability to locate and attack tactical ballistic missile launchers will become an increasingly vital task.

The second major objective of tactical air operations would be to delay, disrupt, and destroy enemy follow-on forces prior to their entry into battle, to impede resupply efforts, and to generally disrupt the enemy's land campaign. The key tasks for accomplishing this interdiction mission include: (1) slowing or halting movement along key lines of communication; (2) destroying or disabling Soviet maneuver units en route to the front; (3) disrupting enemy battle management; (4) destroying or disabling transport in the enemy rear; (5) destroying major supply concentrations; and (6) supporting U.S. and allied counterthrusts.

The third major objective would be to assist army units directly during battles with enemy ground forces by supplying close air support --i.e., by destroying or disrupting enemy maneuver units and fire support elements engaged with, or in close proximity to, friendly troops. Initial U.S. and allied ground operations and associated close air

support in a war against the Warsaw Pact or North Korea would likely focus on turning back the enemy's opening breakthrough assaults. The successful conduct of air interdiction operations against selected enemy follow-on maneuver units would also provide important aid to friendly ground forces.

Tactical air reconnaissance undertaken to gain information about enemy activities and the results of friendly operations would be another key tactical air mission. This activity, conducted by manned and unmanned air-breathing systems equipped with a variety of sensors, represents an important element of the surveillance function described in our framework. Many reconnaissance sorties undertaken to acquire such information can be usefully planned in terms of the sequential functions outlined in the concepts of operations approach set forth in this Note.

We suggest that families of concepts of operations be formulated for these missions and tasks. These concepts should reflect the varying capabilities of the different sensors, command and control networks, and attack platforms that can be linked together to accomplish the various tasks.

### III. BASIC FUNCTIONS FOR THE EMPLOYMENT OF AIR POWER

Figure 1 displays a conceptual framework that identifies the basic functions that must be undertaken for the effective employment of air power to accomplish the missions and tasks set forth in the preceding section. The framework applies to both strategic and theater air operations with either conventional or nuclear weapons. In this Note, however, we confine our discussion to exploring its utility in theater warfare waged with conventional weapons.

These functions proceed in the following sequence. Surveillance is conducted throughout the theater to gain information regarding enemy operations and to measure the success of friendly forces responding to them. Information gathered by surveillance sensors is then brought together for correlation and analysis at assessment centers. Personnel in these centers assess what is taking place on the battlefield, in the air, and in the rear and predict the location and timing of major breakthrough assaults and the main avenues of enemy advance over the next day or so. The assessments and predictions are used to identify specific targets and target areas for possible attack.

The theater commander then uses the assessments of the unfolding air-land battle, together with other information, to select an overall operational strategy to guide the employment of available ground, air, and naval forces. He also apportions his available air forces among various missions and geographic areas. Subordinate command centers translate the commander's broad guidance into the identification of specific targets to be attacked and assist the forces in conducting the operations desired. Wings and fire support elements from U.S. and allied air and ground forces generate fueled and loaded aircraft, missiles, or other attack systems according to a prescribed schedule to conduct attacks.

Control centers assist in the execution of some of these attacks by assigning targets to specific attack assets on the basis of the latest intelligence and by helping them to locate and engage the targets. Surveillance and control systems, such as radars and other

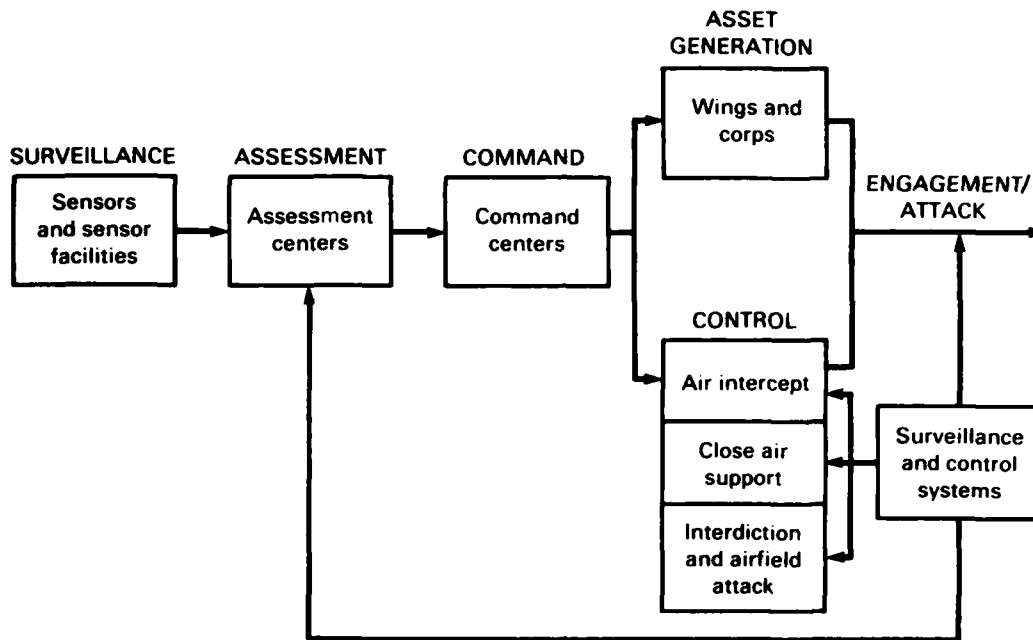


Fig. 1 — Critical functions for the employment of air power in theater war

specialized long-range target acquisition and tracking sensors, often help with the latter task. Finally, the long-range missile and airborne attack platforms engage and attack the various targets including enemy aircraft, air bases, lines of communication, supplies, battle management capabilities, and operational units on the ground.

This dynamic process contains important feedback loops. One loop involves the repeated return of manned aircraft to bases—not necessarily the one they took off from—following each sortie for repair, maintenance, and refueling and then their retasking and reemployment by the command-control network. Another feedback loop involves the steady flow of surveillance information and assessment activity that continuously monitors the effectiveness of missions just performed and the enemy's response. This, in turn, provides the basis on which U.S. and allied commanders adjust their operational strategy and apportion and direct the forces to carry it out.

Figure 2 elaborates on Fig. 1, presenting in greater detail the organizational elements, the functions they perform, and the nature and direction of key information flows. Figure 2 will serve as the major point of reference for the discussion of the organizational elements and the functional flow between them.

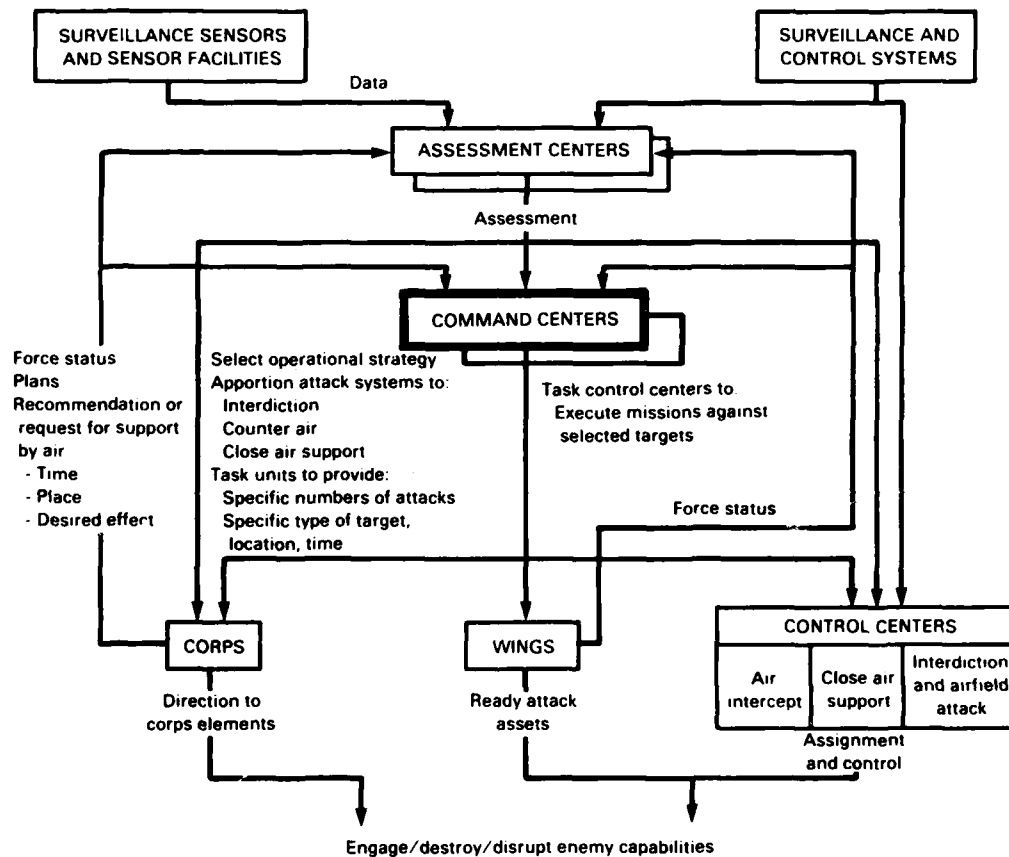


Fig. 2 — Conceptual framework for the employment of air power in theater war

By representing the assessment and command centers in tiers, Fig. 2 suggests the many levels at which these activities are carried out in a given theater. One level provides overall theater assessment and command responsibility; subordinate levels of command and assessment develop information and make decisions to translate the

theater commander's operational strategy and force apportionment decisions into specific taskings regarding operations to be undertaken by particular air and ground forces.

The following analysis of the functions involved in tactical employment deals not only with their fundamental purposes, but also with how they are evolving in response to changes in threats, doctrine, and technology.

#### SURVEILLANCE: BY SENSORS AND SENSOR FACILITIES

Surveillance sensors and associated sensor processing facilities provide timely information about ongoing and anticipated enemy activities in the air and on land and about the results of engagements between enemy and friendly forces. Area surveillance systems monitor large portions of the theater, while more narrowly focused sensors are directed at areas that have been identified as particularly critical.

Decisions about the focusing of individual sensors are a vital part of the continuous interaction between command and assessment personnel, who must resolve together what information is needed to support assessment, command decision, and engagement activities. The various surveillance sensors, which may be located on the ground, in the air, or in space, detect electronic emissions, intercept communications, and detect and identify the movement of enemy forces in the air and on the ground. Sensor facilities should, to the maximum extent possible, be capable of processing data in near real time, often from several different collection sources at once.

Because surveillance is such a critical function in warfare, information about both the capabilities and location of many sensor devices is highly classified. One of the principal challenges now facing the United States and its allies in the area of surveillance is the need to develop ways to make timely and effective use of collected information without revealing the character or location of the collection devices and thereby exposing them to enemy countermeasures.

The timely and effective use of surveillance information in coalition warfare implies the ability to exploit such data without the obstacles to access that are associated with the tightly controlled

handling of these data in their raw form. Some suggest that the barriers associated with access to special compartmented intelligence information will quickly be cast aside in wartime. This appears unlikely. Moreover, were this to occur, many assessment and command personnel would be unable to exploit the information effectively because they lacked prior experience in using such data. A means is needed to "scrub" the information and thus remove special compartmentation barriers; that is, the critical content must remain intact but the identity of the collection means must be adequately shielded.

Surveillance information might be made more readily available if the nationally owned and operated sensor facilities could screen and then transmit it to the assessment centers in an uncompartmented or "white" format. This sanitized information could then be used by individuals without special security clearances, including allied officers, within the jointly manned assessment and command centers.

In the NATO theater, this sanitized information could be made available to all those with NATO-SECRET clearances, that is, by all those likely to be involved in wartime staff support. Under such circumstances, sensor facilities would remain nationally owned and controlled, but their output could be used multinationally.

#### ASSESSMENT: BY ASSESSMENT CENTERS

Once a war begins, the theater commander and his various subordinate command elements will require a continuous flow of assessments of both the current air, land, and naval situation and the expected character of the enemy's air-land campaign. Predictions of the likely location of enemy breakthrough assaults and the major lines of advance along which follow-on forces will move over the succeeding 12 to 24 hours are particularly important. The theater commander bases his overall direction of the combined arms battle on timely, accurate assessments. Consequently the quality of the work performed by the assessment center supporting the theater commander will play a central role in determining the effectiveness of the conduct of the war.

Assessment centers serving subordinate Army and Air Force commanders working under the direction of the theater commander have a

dual function. They, like the assessors serving the theater commander, must provide the commanders they serve with reports on the current and expected flow of the battle in their particular sectors. Evaluations passed on from the main theater assessment center can assist this task. Lower-level assessment centers must also provide detailed information on the location and status of specific enemy air, ground, and naval concentrations to support the development of taskings to attack specific target areas or individual targets and, in many cases, to assist air crews in planning and carrying out attacks.

A major challenge facing the United States is the effective incorporation in the assessment function of advanced computer-driven display technology. Because of their potential to increase the speed at which information can be correlated, displayed, and assimilated, computer graphics may well be the key to permitting the surveillance-assessment-command-control link to operate in near real time.

The United States should develop appropriate automated correlation-display capabilities to support both the vital theater assessment center serving the theater commander and the other centers supporting the subordinate command elements. While proceeding with the development and fielding of improved display technologies, the United States must also retain the ability to operate using the traditional means of information transmission and display--teletype messages, plexiglas display boards, grease pencils, and wall maps. Both the traditional means and personnel trained to use them may be needed for backup in crisis contingencies if critical data links or computer capabilities are disrupted.

The need for sanitized surveillance information creates further problems for assessment. In addition to the method of scrubbing the information within the nationally owned sensor facilities, described above, it may be possible to keep the information compartmentalized until it is passed to assessment centers, where it would then be put through a process of fusion or correlation, providing that the special access information can be adequately protected during this process. This correlation-display process, performed at the front end



of the assessment center, could serve to mask the identity of the individual sensors that provided the necessary information.

Regardless of how the information is sanitized, the critical questions are whether assessors are sufficiently well trained to accomplish this task, whether they would have adequate information to make their evaluations and whether commanders would have the necessary confidence in the assessments made on this basis. Even when such sanitization could be accomplished, both assessors and commanders are likely to want access to a special compartmented channel which can be used to check into questionable or especially crucial information. Once assessment centers evolve toward extensive use of computer graphics, personnel will have to be trained to deal with the increased amount of data and speed of presentation.

Whatever the means of information collection, sanitization, correlation, and display, the key to rapid, effective assessment remains the skill of the personnel who perform this important function. Assessors must be experts in enemy strategy, tactics, and capabilities and familiar with the theater environment. Their collective experience and expertise, demonstrated in realistic peacetime command post simulations, should earn them the confidence of the theater commander and his subordinate commanders, who will depend on their assessments in selecting and implementing an operational strategy in wartime.

#### COMMAND: BY A HIERARCHY OF COMMAND CENTERS

The hierarchy of command centers in the theater assist the theater commander and his component commanders in making critical decisions about the operational strategy to be employed and, on behalf of the commander, help direct the implementation of these decisions. Command decisions are made on the basis of analyses from assessment centers, which are usually, but not necessarily, colocated with command centers, and information on the status and location of friendly forces that is typically provided by these forces themselves.

The overall theater commander, traditionally a senior ground force commander, operating with the assistance of his air, ground, and possibly naval component commanders and his staff, must determine

the overall operational strategy for the unfolding battle, establish objectives, priorities, and the broad scheme of maneuver for his combined arms campaign. These organizational arrangements and procedures will pertain in both a U.S. only and an allied context.

The theater commander must also decide, in response to recommendations made by the air component commander, the apportionment of air assets to the various key missions--offensive counterair, defensive counterair, defense suppression, interdiction, and close air support --and to the geographic sectors of the theater. These strategy and apportionment decisions must be made at least once every 24 hours throughout the conflict; often, they will have to be adjusted more frequently as circumstances dictate and capabilities permit. In the critical opening days of a major conflict, the need for a more intensive and more frequent orchestration will be particularly acute.

When making the critical decisions regarding air power for the operational strategy and apportioning air forces to the various key missions, the theater commander, the air component commander, and their staffs must think not simply in terms of air operations to be conducted over the succeeding several hours but in terms of a lengthy air campaign lasting days or even weeks. They must think in terms of an extended planning horizon if they are to make near-term allocations that support the optimum use of air power assets over the course of the conflict. They must plan well ahead, particularly for scenarios in which mobilization and reinforcement will substantially increase the aircraft available over time.

In the early 1970s, Air Force Studies and Analysis developed computer simulations, such as Saber Grand, to investigate the impact of varying U.S. tactical air apportionment strategies and force developments on the relative ability of the opposing sides to bring air power to bear against each other's ground targets. The Air Force should take advantage of modern computer capabilities by resurrecting and updating such simulations as a means to enrich understanding of the tactical use of air power, to test various strategy combinations, and to provide a basis for better training commanders and staffs to perform this critical task in peacetime. Moreover, such training

would also furnish the necessary skills and computer support to perform such analyses at key command posts during wartime.

Subordinate sector commanders and control centers, in particular the tactical air control centers (TACCs), must translate the theater commander's broad operational strategy into a series of coordinated attacks launched against selected elements of the enemy's military capability. They must determine the time, place, and desired effects of major interdiction, defense suppression, and offensive counterair attacks and provide close air support sorties to the various ground force units according to an agreed schedule. Finally, they must direct control elements to take the necessary steps to carry out the desired attacks against specific targets at designated times.

The Army's new AirLand Battle doctrine calls attention to problems of coordinating Army and Air Force efforts to select and prioritize targets among enemy follow-on forces in the so-called deep battle. The doctrine calls for Army commanders at the division and corps levels to take the lead in orchestrating attacks against enemy forces moving toward the battle in *areas of influence* and *areas of interest* that extend up to a few hundred kilometers behind the forward line of troops (FLOT). We have serious reservations about the wisdom of having the corps commander determine the targets for such interdiction attacks.

The new Army doctrine calls for organic Army long-range missiles not yet developed or fielded and Air Force fighter-bombers to mount these attacks with improved conventional munitions. The attacks will be designed to delay, destroy, and disrupt the arrival of enemy second echelon units crucial to his blitzkrieg doctrine and to help create opportunities for launching counterthrusts on the ground at the tactical and operational levels.

To support the AirLand Battle doctrine, the Army is developing new equipment and new arrangements at the corps level for the correlation and assessment of surveillance information to assist the corps commander in establishing targeting priorities against enemy follow-on forces. Recent Army discussions of the doctrine suggest that the corps commander's targeting recommendations for air interdiction attacks in the enemy rear are to be treated as directives by the

personnel manning the tactical air control centers, or the allied tactical operations centers (ATOCs) in NATO. This concept will surely present problems given the multiple corps and multiple ATOCs in NATO's Central Region.

Under current practices, the TACC operations staff, consistent with the overall operational strategy and apportionment of forces by the theater commander, prioritizes targets and ultimately tasks Air Force units to carry out interdiction missions. This process is designed to take into account the needs of local ground force commanders, whose target nominations are represented by the Army's battlefield coordination element (BCE) in deliberations at each TACC. The final decisions, however, rest with the Air Force commanders in the TACC. There is an urgent requirement under any doctrine for the Air Force and the Army to determine how to integrate jointly the functions of surveillance, assessment, targeting recommendations, and the coordination of attacks by aircraft and long-range missiles.

In our view, this coordination should be based on Army requests for aircraft interdiction attacks sent from the corps to the army group level for aggregation and prioritization and then passed on to the allied tactical air forces (ATAFs) and ATOCs. Under this system, corps commanders would inform the army group of their requests by submitting a priority listing specifying the time, place, and desired effect of particular attacks needed to support their desired pattern of defensive and offensive operations. The army group commander would, in turn, develop an overall prioritized request consistent with the aggregate of requests from the various corps under his command and pass this to the ATAF.

Upon receipt of the consolidated listing, the ATAF and ATOC working together would develop specific taskings for attacks consistent with the army group request, the broad interdiction strategy set forth by the theater commander, and the available assets apportioned to the interdiction mission. The Army personnel of the BCE would participate in the specific attack tasking decisions at the ATOC, reconciling these demands, and would keep the individual corps informed about the ability of allied air forces to provide the desired support.

The Air Force and Army have long planned to conduct close air support (CAS) according to agreed organizational arrangements and procedures. Under these procedures, the Air Force would generate CAS sorties in response to the daily air tasking order that reflected the theater commander's basic apportionment decision and the suballocations assigning sorties to specific corps areas made by the subordinate command centers in response to requests from the ground force commanders.

Once tasked, the wings would generate sorties to carry out these CAS missions. The aircraft would be loaded with appropriate standard weapons and made available at various time blocks throughout the day for use by the designated Army commander. After being activated through the close support request network, an aircraft would proceed to its assigned area to be employed against specific targets by an airborne or ground-based forward air controller, who would receive his direction regarding the areas or targets to be struck from the local ground force commander on the scene.

The hierarchy of command centers throughout the theater would be manned by a combination of Air Force and Army personnel and if naval forces were involved, by naval representatives as well. In the NATO and Korean theaters, most command centers would also include allied command and staff personnel.

#### CONTROL: BY CONTROL CENTERS AND BY SURVEILLANCE AND CONTROL SYSTEMS

Control centers assist in mounting the attacks called for by the commanders. They assign targets to individual attack systems and assist them to varying degrees in engaging these targets. As Figs. 1 and 2 (above) indicate, specialized control networks have been developed to perform the major missions: air intercept (defensive counterair), close air support, and the deeper air attack missions of interdiction and offensive counterair. Each of these networks has unique characteristics.

In the first two mission areas, air intercept and close air support, controllers use near real time information about the location of the target to assign targets to individual attack platforms and to

assist them in engaging these targets. In air intercept operations, ground- or air-based controllers use radar tracking information to assist interceptor aircraft in acquiring and engaging hostile aircraft. The amount of this assistance can vary widely.

Controllers may provide detailed assistance that helps guide the interceptor right up to the point of final engagement and attack. Alternatively, if the interceptor has advanced on-board target acquisition capabilities, the pilot may be given nothing more than the initial position of the hostile aircraft; he would then complete the intercept and attack autonomously, without further assistance. In close air support operations, airborne forward air controllers directly observe enemy forces on the ground and assist attack aircraft in delivering their ordnance in accordance with the requests of the ground commander on the scene.

At present, the TACC (called the ATOC within NATO) performs the Air Force target assignment aspect of control for the air interdiction and airfield attack missions. The TACC assigns targets to specific attack aircraft by means of the daily air tasking order, or frag, which is sent to the wing several hours prior to the first series of scheduled takeoffs. The aircraft usually receive no further intelligence assistance or updates on target location and status between the time they take off and the time they complete their mission.

The target assignment process began to change with the development of the "rolling" frag. This allows the TACC to instruct wings regarding the type of mission, weapon loading, and anticipated takeoff time according to the traditional long-lead time schedule. Thus, it supports sortie preparation several hours in advance but delays the identification of the specific target until a point much closer to takeoff.

The Air Force has only recently begun to develop concepts and organizational arrangements for the provision of near real time assistance to attack platforms carrying out these missions. Much of this effort involves the design of a new control element, the ground attack control center (GACC), and the development of procedures to link it with the attack systems and the surveillance and control systems.

The attack systems include aircraft, missiles, and remotely piloted vehicles. Two highly promising surveillance and control systems, the precision location strike system (PLSS) and the joint surveillance and targeting radar system (JSTARS), currently under development, are slated to provide valuable external engagement assistance to NATO attack aircraft and missiles. The PLSS, an airborne platform orbiting far behind the FLOT, will detect and locate enemy electronic emitters and transmit this information in near real time to assessment centers, the GACC and, in some modes, directly to the attack assets in flight. The JSTARS, an airborne moving target indicator radar (formerly called the Pave Mover radar program), deployed on helicopters and aircraft, will from various standoff distances track groups of enemy vehicles moving on the ground, and transmit this information to the same elements served by PLSS.

The GACC may play various roles in this process. It may serve simply as a matchmaker, assigning a specific target to a ready attack system just prior to or just after takeoff. The attack system may then proceed autonomously, using on-board systems to strike the target. Or the GACC may mate the attack system with an appropriate surveillance and control system, which would provide a steady stream of updated engagement assistance directly to the attacker in flight.

Alternatively, the GACC may perform a direct control function. Using the latest information generated by the same standoff surveillance and control systems or by the assessment center, the GACC could provide a steady stream of instructions (guidance updates) directly to the attack system in flight.

Whatever the interconnections among these elements, interdiction missions of the future will involve three kinds of control--broadcast control, close control, and precise control--which are distinguished from one another in terms of the degree of external assistance provided to the attacker. With broadcast control, the GACC will assign a target to a specific attack system prior to or just after takeoff or launch but will provide no further assistance. The system will proceed to the assigned target area autonomously, using its on-board navigation capability; it will then engage and attack the target,

using highly capable on-board engagement systems associated with the attack platform and the weapons it carries.

With close control, the GACC will assist the attack system by providing both initial target assignment and a series of updates on the location and status of the target while the attack system is en route. Nevertheless, the attacker will retain the responsibility --using on-board systems--to complete the engagement/attack sequence on its own. Under precise control, the GACC will provide continuing in-flight assistance to the attacker's on-board navigation and fire control systems right up to the point of weapon activation and release, in most cases without the use of engagement sensors aboard the attack platform itself.

The successful integration of the latest intelligence information from external engagement systems into the command and control process can support even more timely application of air power against critical enemy targets. If the objective is to attack critical follow-on forces, such as operational maneuver groups or airfields, in the midst of flight operations, information from PLSS, JSTARS, and even the airborne warning and control system (AWACS) can be fed as near real time direct inputs to aircraft in flight, relayed in the form of broadcast, close, or precise control. To do this, the Air Force will have to improve its capabilities for continuously monitoring and orchestrating the availability and weapon loadings of friendly attack forces to implement such highly responsive strategies.

Advancing technologies are making the centralized direction of the air campaign by means of coupling near real time surveillance with command and control more and more plausible. The Soviets know of these technologies and their potential to support substantially more responsive and effective air operations. They will be prepared to devote considerable efforts to degrading these capabilities in wartime.

Even state-of-the-art technologies, however, will probably not be able to ensure the uninterrupted flow of data from the various advanced electronic systems in a combat environment. Consequently, the Air Force must seek to ensure the survivability and continuous



effective operation of the various elements and take the appropriate steps with regard to hardening.

The Air Force should provide in advance for backup modes of operation based on substitution and devolution among the various command, control, and asset generation elements to support continued operations when key components are disrupted or destroyed. In terms of the command and control function, this means that the less sophisticated and less centralized modes of executing missions must be retained as fallbacks from the technologically advanced systems described above.

Under certain circumstances, individual wings may have to plan as well as implement operations. To do this, they will need the greatest possible access to information still being collected by sensors and processed by assessors. Their access to this information will be limited, however, by the costs of advanced communications and computer capabilities and by the special security measures required by much of the surveillance and assessment information.

In summary, planning for the centralized integration of new, sophisticated systems must be accompanied by planning for the decentralized conduct of operations with only portions of the system operational and without some elements altogether.

#### ASSET GENERATION: BY WINGS

The United States and its allies must be capable of mounting sustained air operations, night and day, over an extended period in order to defeat enemy attacks, gain air superiority, and bring firepower to bear against enemy forces at the front and in the rear. To support such operations, individual aircraft and aircrews must repeatedly be readied for flight, sent off, recovered, recycled, and re-launched--all in the face of determined enemy opposition. The Air Force must therefore continue to develop and practice maintenance, refueling, and rearming techniques that allow it to sustain surges to higher levels of daily aircraft sortie generation for extended periods.

As the Air Force moves toward an era in which target assignment for deeper attack missions will be provided just prior to or even after takeoff, it will have to develop procedures for crew preparation and aircraft weapon loading that support such responsive, real-time battle management. This will likely also entail further changes in the character of the air tasking order and wing-level attack preparations consistent with the repeated generation of sorties at designated time intervals, with the aircraft carrying standard loads for various missions.

#### ENGAGEMENT ATTACK: BY ATTACK ASSETS

The ultimate objective of the various support, command, and control activities described in this sequential framework is to enable the attack platform to successfully engage and destroy enemy targets. The attacker may perform these crucial functions autonomously, that is, relying on a combination of the engagement systems on board the platform itself and those built into the weapons and munitions that it carries. Or it may receive varying degrees of assistance from external engagement, surveillance, and control systems, as previously described.

The assistance that the attacker receives is designed to enhance the timeliness and effectiveness of the attack. In many cases, it will also reduce losses in the terminal area by allowing the aircraft to execute its attack in a single pass at low level while standing off from the target, thus minimizing its exposure to enemy defenses.

Over the next several years, the United States plans to field a variety of improved on-board and external engagement systems. Aircraft such as F-16s will carry the combination of navigation and forward-looking infrared (FLIR) targeting pods known as low altitude navigation and targeting infrared for night (LANTIRN). External engagement systems will include PLSS and JSTARS, described above. The United States is also developing increasingly "smart" weapons and munitions, many of which will be capable of providing multiple "kills" per pass, using standoff delivery tactics.

Varying combinations of attack platforms, control modes, engagement tactics, weapons, and munitions will be available at the payoff end. These critical functions are all too often viewed in isolation. But they are closely interrelated. The table below illustrates the relationship among mode of control, the type of on-board engagement/attack systems, and the type of weapon. Various combinations may be used for successful air interdiction attacks on a cluster of enemy vehicles--tanks, infantry fighting vehicles, trucks, etc.

This table underscores the point that useful analysis of the engagement/attack process requires that all associated elements--the attack platform, engagement systems, mode of control, and weapons and munitions employed--be explicitly considered. The examples below illustrate this point.

The GACC will be able to provide external assistance in the form of either close or precise control to a variety of attack systems, including aircraft equipped with highly capable on-board engagement systems. An F-16 equipped with LANTIRN and carrying a tactical munitions dispenser (TMD) armed with smart submunitions will profit from the use of close control based on JSTARS tracking data. Such close control will allow the F-16 to approach the target so that the target, when it first appears, is along the velocity vector of the aircraft; the F-16 can then deliver the free-fall TMD while remaining at low level, thus reducing its exposure to terminal air defenses.

This same F-16, carrying LANTIRN and a powered tactical munitions dispenser with an off-boresight short-range standoff delivery capability, rather than a free-fall TMD, will be able to engage and attack autonomously while remaining at low level, with no assistance beyond the initial target assignment provided under broadcast control. Such a weapon then has the potential for more autonomous and more effective attacks using only on-board engagement systems and with reduced exposure to the attacking aircraft.

Similarly, a B-1 equipped with (1) a synthetic aperture target acquisition and tracking radar, (2) a joint tactical missile (JTACM), a long-range standoff ballistic missile, and (3) a load of conventional

Table

## MODES OF ENGAGEMENT AND WEAPONS

Mode of Engagement			Weapon	
Type of Control	Engagement System on Board Attack System	Attack System	Type	Mode of Guidance
Broadcast control	FLIR targeting pod + laser radar	F-16	Powered tactical munition dispenser	Fire control + pure inertial
	Synthetic aperture radar	B-52 or B-1	Joint tactical missile (JTACM)	Inertial + updates from engagement system on B-52 or B-1
Close control using JSTARS	FLIR targeting pod + Laser radar	F-16	Maverick	Lock-on before launch
			Tactical munition dispenser (TMD)	Fire control + free fall
	I <sup>2</sup> R via data link from weapon	F-4	GBU-15 I <sup>2</sup> R(SUU-54)	Command guidance or lock-on after launch by direction of weapon system operator
Precise control	None	F-16 or F-4	TMD	Free fall
	Navigation only	B-52 or B-1	JTACM	Inertial + updates, possibly from JSTARS
	(Not applicable)	Corps support weapon system	Ground-launched JTACM	Inertial + updates from JSTARS

terminal homing submunitions like Skeet will also be able to operate under broadcast control to conduct interdiction attacks autonomously against clusters of enemy vehicles.

Finally, the GACC will provide the extensive external assistance of precise control with the help of target location information from JSTARS or PLSS in order to guide attacks by F-16s or F-4s lacking sophisticated on-board engagement systems and equipped with a tactical munitions dispenser (TMD). Precise control may also be used to guide attacks against enemy vehicle clusters by long-range standoff JTACMS launched from either an aircraft--a B-1 or a B-52, for example--or an Army-owned and operated ground-based launcher. The latter combination of JSTARS and the ground-launched variant of JTACM for long-range standoff attack has been under development for the past few years under the designation Assault Breaker.

#### IV. A MATRIX FOR DEVELOPING CONCEPTS OF OPERATIONS FOR TACTICAL AIR OPERATIONS

The matrix shown in Fig. 3 reflects our belief that tactical air missions and their constituent tasks can be usefully addressed in terms of concepts of operations that set forth the sequence of key functions that are to be performed to accomplish a given task. This matrix is designed to assist in the development of concepts of operations to perform the various tasks of the major missions.

One can fill in the matrix, in general terms, simply by describing the key functions that are to be performed sequentially to support a given task. Or one can use it to develop detailed individual concepts of operations that specify the precise arrangements for linking the various systems and organizations, end-to-end, from surveillance through engagement/attack, to accomplish a given task in a timely and effective manner.

Such concepts of operations may apply to the present or future. Both current and longer term concepts should be developed with an eye toward gaining maximum effectiveness from existing assets and organizational elements. Longer term concepts offer the added opportunity to shape the development of future systems and organizational arrangements themselves; that is, the concepts can be used to help guide the development and acquisition of integrated capabilities that support a repertoire of highly effective and responsive force employment capabilities.

To illustrate the application of concepts of operations, we have filled in the matrix columns for the interdiction mission in general terms, as shown in Fig. 4. This example projects to the late 1980s, when a variety of new surveillance, assessment, and engagement systems, as well as new weapons and munitions, all currently under development, will be available for allied air forces operating in NATO's Central Region.

Individual concepts of operations connecting the various functions and organizations described in the matrix could be created to

Functions and Organizational Elements Objectives, Missions, Tasks	Surveillance by Sensors	Assessment by Assessment Centers	Command at Various Levels	Control by Control Centers	Sortie Generation by Wings	Engagement/ Attack by Attack Assets
Gain air superiority Defensive counterair Intercept attackers & escorts Cover own attackers Offensive counterair Suppress enemy sortie generation Disrupt air battle management Disrupt air logistic support Air defense suppression Suppress mobile & fixed SAMs & AAA Disrupt air defense radars & communications						
Delay, disrupt, & destroy follow-on ground forces & logistic support Interdiction Slow/halt movement along key LOCs Delay, disable, & destroy forces in rear Disrupt battle management Disrupt/destroy logistic support Support friendly counterthrusts						
Support engaged ground forces Close air support Destroy, disable, & disrupt enemy maneuver units & fire support near friendly forces						
Monitor activity in enemy territory Tactical air reconnaissance Monitor enemy ground & air force movements & activities Acquire information on results of friendly operations						

Fig. 3 — Matrix for developing concepts of theater air operations

Functions and Organizational Elements Missions, Tasks	Surveillance by Sensors	Assessment by Assessment Centers (TFC/COIC)	Command at Various Levels (AFCENT/ATAF/ATOC)	Control by Control Centers (ATOC/GACC)	Sortie Generation by Wings	Engagement/Attack by Attack Assets
Interdiction Slow/halt movement along key LOCs Delay, disable, & destroy forces in rear Disrupt enemy battle management Disrupt & destroy logistic support Support friendly counterthrusts	<ul style="list-style-type: none"> <li>● Focus on movements along key LOCs &amp; status of key choke points</li> <li>● Monitor unfolding ground offensive</li> <li>● Find assembly areas, command posts, &amp; major logistic concentrations</li> </ul>	<ul style="list-style-type: none"> <li>● Identify main axes of attack &amp; location of major troop concentrations</li> <li>● Identify key bridges &amp; rebridging efforts, choke points, &amp; command posts</li> <li>● Support timely attacks on selected fixed &amp; mobile targets</li> </ul>	<ul style="list-style-type: none"> <li>● Select interdiction strategy</li> <li>● Apportion aircraft &amp; missiles to mission</li> <li>● Direct execution of preplanned attacks on choke points, assembly areas, &amp; other fixed targets</li> <li>● Direct execution of timely attacks against lucrative vehicle clusters, bridging efforts, &amp; other mobile &amp; fleeting targets</li> </ul>	<ul style="list-style-type: none"> <li>● Assign priority interdiction targets to specific attack systems, using               <ul style="list-style-type: none"> <li>- Normal frag</li> <li>- Rolling frag</li> </ul> </li> <li>● Assignment to attack assets in flight</li> <li>● Assist in executing timely attacks on mobile &amp; fleeting targets, using               <ul style="list-style-type: none"> <li>- PLSS</li> <li>- JSTARS</li> </ul> </li> <li>● Correlated intelligence from assessment centers</li> </ul>	<ul style="list-style-type: none"> <li>● Make attack assets available as directed</li> <li>● Prepare to command &amp; control attacks in case of loss of contact with higher authorities</li> </ul>	<ul style="list-style-type: none"> <li>● Execute engagement/attack against specified targets, using on-board engagement systems and/or aid from control centers &amp; external engagement systems (PLSS, JSTARS) as available &amp; appropriate</li> </ul>
Defensive counterair						
Offensive counterair						
Air defense suppression						
Close air support						

Fig. 4 — Concepts of operations for the interdiction mission



support both highly responsive attacks against mobile or fleeting targets and more traditional, longer lead time attacks against fixed targets within the diverse interdiction mission. NATO should develop detailed concepts using different combinations of sensors, assessment techniques, command and control arrangements, engagement systems, attack assets, weapons, and munitions to support repeated attacks on Warsaw Pact forces around the clock in all types of weather.

## V. CONCLUDING REMARKS

We have discussed an overall framework that makes explicit the critical steps to be performed to improve the ability of the United States and its allies to employ air power effectively in theater war. The framework relates objectives, missions, and tasks on the one hand to functions, organizational elements, and systems on the other. We are convinced that this framework can play a significant role in guiding the elaboration of concepts of operations designed to improve Air Force capabilities to carry out the various air power missions.

The Air Force could benefit in many ways if it could reach agreement on a single overall framework and if all would then adhere to this common conceptual approach. The use of an agreed framework would enable planners to determine what organizational elements ought to be established, how they should be equipped, and what should be the proper inputs and outputs for each element.

Such an overall framework could be used to develop the concepts of operations that are needed to meet and defeat a powerful Soviet foe. These concepts of operations could, in turn, guide the development of appropriate new equipment, training exercises, and operational tests. Operational tests could be used to determine whether an overall concept was viable--as distinct from testing the performance of individual pieces of equipment. Undoubtedly, well-defined concepts could assist the Air Force in better exploiting current organizational arrangements and capabilities.

Such a framework and associated concepts of operations could also aid in the development of doctrines for joint and combined operations. It could be used to identify and resolve differences of opinion over the best approach to joint theater operations. It would be useful in discussions such as those under way regarding the AirLand Battle doctrine and those to enhance cooperation in U.S. alliances.

In Korea, and even more so in NATO, the United States should clarify its own views and then initiate discussions with allies to develop a collective framework and associated concepts. The goal would

not be to arrive at identical approaches, but to harmonize national traditions and doctrines and assure that alternative modes complement one another.

Finally, the Air Force needs a straightforward overall framework and concepts of operations developed in this context to serve as a basis for more effective communication with the Office of the Secretary of Defense and the Congress. Members of both groups often have difficulty understanding the connections among the many systems that are under development and being procured at considerable expense.

Moreover, in the absence of a well-reasoned framework and related operational concepts put forth by the military, elements within the Office of the Secretary of Defense and the Congress have all too easy an opportunity to impose their own solutions to these important issues. Having the ability to explain the value of important programs in terms of an overall framework and associated concepts of operations would greatly increase the likelihood that the Air Force will continue to play the leading role in developing concepts for the employment of air power and will obtain the resources it needs to perform its key missions and tasks.

Thus, the Air Force could clearly benefit greatly from an approach that builds on an agreed, coherent framework. The names and descriptions of specific tasks and related functions and organizational elements shown in this Note have been developed and refined in interviews with many Air Force personnel.

The framework generally reflects current doctrine and practice but does so in a more systematic and explicit manner. At the least, the logic, interrelationships, and vernacular set forth in this Note could serve as a starting point for the development of a framework that links objectives, missions, and tasks with functions and organizational elements through the medium of concepts of operations for the effective employment of air power.

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